CLAIMS

1. An apparatus for effecting a change in at least a portion of a selected site of a collagen containing tissue that is adjacent to an at least partially fluid medium, comprising:

an energy delivery device including a proximal portion and a distal portion configured to deliver sufficient energy to the selected site of a collagen containing tissue to effect a contraction in at least a portion of the selected site of a collagen containing tissue;

a sensor positioned at a the distal portion of the energy delivery device to detect a thermal energy from the selected site of a collagen containing tissue and at least a portion of the adjacent at least partially fluid medium, the sensor producing a thermal feedback signal which represents a composite of the thermal energy detected from the selected site of a collagen containing tissue and at least a portion of the adjacent at least partially fluid medium; and

a feedback control system coupled to the sensor and configured to receive the thermal feedback signal and adjust a level of energy delivered to the selected site of a collagen containing tissue.

2. The apparatus of claim 1, wherein the energy delivery device is constructed from platinum.

3. The apparatus of claim 1, wherein the energy delivery device is constructed from stainless steel.

4. The apparatus of claim 1, wherein the energy delivery device is constructed from memory metal.

5. The apparatus of claim 1, wherein the energy delivery device is a composite construction.

6. The apparatus of claim 5, wherein a component of the composite construction does not conduct energy delivered by the energy delivery device.

7. The apparatus of claim 1, wherein the energy delivery device is an RF energy delivery device coupled to an RF energy source.

8. The apparatus of claim 1, wherein the energy delivery device is a resistive heating element coupled to a resistive heating source.

9. The apparatus of claim 1, wherein the energy delivery device is a microwave probe coupled to a microwave source.

10. The apparatus of claim 1, wherein the sensor is a thermocouple.

11. The apparatus of claim 1, wherein the sensor is a thermistor.

12. The apparatus of claim 1, wherein the sensor is an optical coated fiber.

13. The apparatus of claim 1, further comprising:
a handle coupled to the proximal portion of the energy delivery device.

14. The apparatus of claim 1, further comprising:
an electrical insulator positioned at least partially around an exterior surface of the energy delivery device.

15. The apparatus of claim 1, further comprising:

a thermal insulator positioned at least partially around an exterior surface of the energy delivery device.

16. The apparatus of claim 1, further comprising:

an electrical insulator positioned at least partially around an exterior surface of the energy delivery device and

a thermal insulator positioned at least partially around an exterior surface of the energy delivery device.

17. The apparatus of claim 1, further comprising:

a thermally insulating material coupling the sensor to an exterior surface of the distal portion.

18. The apparatus of claim 1, further comprising:

a thermally conductive material coupling the sensor to an exterior surface of the distal portion.

19. The apparatus of claim 1, wherein the sensor is positioned to detect a thermal energy from substantially only the selected site of a collagen containing tissue.

20. The apparatus of claim 1, further comprising a second sensor.

21. The apparatus of claim 1, wherein the sensor is a band at least partially positioned on an exterior surface of the distal portion.

22. The apparatus of claim 1, wherein the sensor is positioned in an interior of the distal portion of the energy delivery device.

23. The apparatus of claim 1, wherein the sensor is a positioned on an exterior surface of the distal portion and extends to an interior of the distal portion.

24. The apparatus of claim 1, wherein the distal portion is steerable.

25. The apparatus of claim 1, wherein at least a portion of the energy delivery device is configured to be introduced through an operating cannula.

26. The apparatus of claim 1, wherein at least a portion of the distal portion is hollow.

27. The apparatus of claim 26, wherein the distal portion has a substantially uniform wall thickness.

28. The apparatus of claim 26, further including a potting compound located in the hollow interior for positioning the sensor.

29. An apparatus for contracting a collagen fibers in a selected site of a collagen containing tissue at least partially is adjacent to a fluid medium, comprising:

an energy delivery device including a proximal portion and a distal portion configured to provide a selected thermal distribution in the selected site of a collagen containing tissue and effect a controllable contraction of at least a portion of the collagen fibers;

a sensor positioned at the distal portion of the energy delivery device; and

a feedback control system coupled to the sensor, wherein a position of the sensor, a geometry of the distal portion of the energy delivery device and the feedback control system provide a controllable energy delivery to the selected containing tissue site.

30. A method for contracting a collagen fibers in a selected collagen containing tissue site at least partially adjacent to a fluid medium, comprising:

providing an apparatus including an energy delivery device with a proximal portion, a distal portion, a sensor and a feedback control system coupled to the sensor;

delivering sufficient energy to the collagen containing tissue site to produce a selected contraction of the collagen containing tissue site;

detecting a thermal energy at the selected collagen containing tissue site and at least a portion of the adjacent fluid medium;

producing a thermal feedback signal which represents a composite of a thermal energy of at least a portion of the selected collagen containing tissue site and the adjacent fluid medium; and

adjusting a level of energy delivered to the selected collagen containing tissue site.

31. The method of claim 30, wherein sufficient energy is delivered to generate a selected thermal distribution in the selected a collagen containing tissue site to effect a contraction of the collagen fibers irrespective of a temperature differential between the collagen containing tissue site and the adjacent fluid medium

32. The method of claim 30, wherein the collagen containing tissue site is a ligament.

33. The method of claim 30, wherein the collagen containing tissue site is a joint capsule.

34. The method of claim 30, wherein the collagen containing tissue site is a vascularized densely collagenous structure.

35. The method of claim 30, wherein the collagen containing tissue site is a connective tissue.

36. The method of claim 30, wherein the feedback control system is configured to be overridden by a surgeon.

37. The method of claim 30, wherein the level of energy is adjusted such that a temperature at the selected site is maintained at about 45 to 75 degrees C.

38. The method of claim 30, wherein the level of energy is adjusted such that a temperature at the selected site is maintained at about 45 to 65 degrees C.

39. The method of claim 30, wherein a level of energy applied to the collagen containing tissue site is adjusted such that a temperature at the selected site is maintained at about a desired temperature.

40. The method of claim 30, wherein the level of energy applied to the collagen containing tissue site is adjusted such that a temperature at the selected site is maintained at about a desired temperature for a desired time.

41. The method of claim 30, wherein the level of energy applied to the collagen containing tissue site is adjusted such that overshoots are minimized.

42. The method of claim 30, wherein the adjacent fluid medium is at least partially flowing.

43. The method of claim 30, wherein an energy applied to the collagen containing tissue site is adjusted to minimize cell necrosis.

44. The method of claim 30, wherein an energy applied to the collagen containing tissue site is adjusted to eliminate cell necrosis.